



**METHOD OF TEST
TO DETERMINE THE AMOUNT OF SHALE IN COARSE AGGREGATE
(FIELD PROCEDURE OF IOWA TEST METHOD 210)**

SCOPE

This test method covers the procedure for the approximate determination of the shale content in coarse aggregate. This method separates, along with the shale, other particles of low specific gravity.

PROCEDURE

A. Apparatus

1. Balance having a capacity of at least 2500 g and sensitive to 0.1 g
2. A strainer with openings not larger than 2.36 mm (#8 sieve)
3. Two bowls of sufficient capacity
4. A solution of zinc chloride (ZnCl_2) having a specific gravity between 1.950 and 1.999 at 21°C (70°F).

NOTE: To prepare one gallon of solution, slowly add 5670 g (12.5 lb.) of technical grade zinc chloride to 2248 g (4.75 pt.) of water with constant stirring. The zinc chloride is added slowly to all the needed water to avoid generating excessive heat during the dissolving process. When all zinc chloride is in solution, cool to 21°C (70°F) and measure specific gravity with a hydrometer. If the sp. gr. is below 1.95, add zinc chloride in 227 g (0.5 lb.) increments until the sp. gr. of the solution is at least 1.95 at 21°C (70°F). It may be necessary to heat the original solution slightly in order to dissolve additional zinc chloride in a reasonable time.

5. Drying oven or hot plate
6. Mixing spoon

B. Test Procedure

1. A sample of approximately 2500-grams of + 4.75 mm (+ #4) material shall be selected by quartering or splitting to insure representation.

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2. Dry the sample to a constant mass (weight) in an oven at a temperature of $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$) or on a hot plate at low heat setting with frequent stirring to avoid local overheating. Weigh to the nearest 0.1 g.

CAUTION: There is no particular hazard from the fumes of zinc chloride solution, but protective clothing should be worn. This includes gloves, goggles, and face shields. Mix in a well-ventilated area.

3. Place the dried sample of aggregate in the bowl and pour the solution of zinc chloride over the aggregate until the volume of the liquid is at least 3 times the absolute volume of the aggregate.
4. Agitate the aggregate by vigorously stirring with a large mixing spoon until no additional pieces float to the surface.
5. Skim off the floating particles within one minute.
6. Thoroughly wash the removed particles in the strainer to remove the zinc chloride. Dry to a constant mass (weight) in an oven at a temperature of $110 \pm 5^{\circ}\text{C}$ ($230 \pm 9^{\circ}\text{F}$) or on a hot plate at a low heat setting. Weigh to the nearest 0.1 g.
7. Particles of low specific gravity other than shale may be handpicked and removed prior to weighing.

C. Calculation

1. Calculate the percentage of shale (or shale and other low specific gravity materials) from the following formula:

$$\% \text{ Shale} = \frac{\text{Dry Mass (Weight) of Washed Decanted Particles}}{\text{* Dry Mass (Weight) of Sample}} \times 100$$

* Mass (weight) of the + 4.75 mm (+ #4) material